Patent Application of Franklin Zhigang Zhang

for

TITLE: Expandable Computer Board with Dual Shield Housing Solutions

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of the Provisional Patent Application Ser.No. 60/256,414 filed 12/18/2000.

BACKGROUND – FIELD OF INVENTION

This invention is concerned with a computer system board, specifically a computer system board with dual shield housing solutions for critical environment applications.

BACKGROUND – DESCRIPTION OF PRIOR ART

It is known in the art of the regular Personal Computer (PC) and industrial PC system board design, expansion slots are one of the key mechanisms on the board. They provide the hardware expandability of the system board. On a regular PC system board, ISA, PCI or PCMCIA slot can always be found. PC-104's interfaces were introduced to be the main expansion standard for stackable industrial PC. To expand hardware applications, you can simply insert the compatible add-on cards into the slots on the system board. There is no strictly requirement on the size of a regular PC system board. Electronic components always generate heat and EMI. In the prior art of the PC, in order to eliminate the interference and get better heat dissipation, certain spacing and size is required. To avoid EMI or heat issues, the system board is usually designed in bigger size. But when the size of equipment is limited, the size of system board is therefore limited. Thus the interference among the system board and the expansion boards increases. Whole system became unstable, if no interference proof means is implemented.

When applying a system in a particular space limited application, it's hard to shield the electromagnetic wave interference and dissipate the heat among the boards. So, regular design PC cannot be used in many applications, which need to meet the requirements of critical environment. They may cause malfunction of the system for the time being.

Furthermore in some special applications, the interactive interference between the expansion boards and the system board is very strong because of one or more radio frequency circuit boards involved. If there is not proper shield among the system board and the expansion boards, the system even cannot work.

Obviously, better solution is needed.

Summary

The present invention provides the solutions which can get excellent system board expandability in a limit space. The computer board is designed for critical application circumstance. On this board, there is plurality of shield expansion houses.

The shield expansion housing solutions comprise an expansion zone, and a special shield metal housing cover with heat sink that covers the whole expansion zone after an expansion board is installed on to the system board. The expansion zone is a large ground plate of the PCB with connectors, which can connect with the add-on expansion board.

The shield metal housing cover as long as the shield expansion zone works together to conduct the heat generated by the expansion board sealed inside, and, also shields the electromagnetic wave interference between the expansion board and outside house. In my example, dual shield expansion houseing design with high heat sink especially eliminates the cross RF interference under the situation when there are two expansion boards doing radio frequency applications which are installed on to the system.

Objects and Advantages

Accordingly, several objects and advantages are achieved by providing shield expansion houses on the system board of my invention:

1) to provide highly stable and reliable applications of a computer system board in a limited space by the shield expansion housing solution of current invention;
2) to use the shield metal housing cover as well as the heat sink to provide high heat dispatching capability for the expansion board;
3) to shield the electromagnetic wave interference among the expansion board and the system board.

The forgoing features and advantages of the present invention can be appreciated more fully from the following description, with references to the accompanying drawings in which.

Brief Description of the Drawings

Fig. 1 is a diagrammatic view of a system board design with the present invention.

Fig. 1A is a cut away side view of the system board taken along line A-A of Fig.1; and the side view of the expansion board, the shield metal housing cover and the add-on extra heat sink.

Fig. 2 is an enlarged view of the shield metal housing cover and the expansion board.

DESCRIPTION-Preferred Embodiment

Fig. 1 is a diagrammatic view of a system board design with the present invention. As shown in this embodiment, the computer system board 10 comprises a PCB 13, a processor 14, the connector 16 (optional), other ICs 15,17 and expansion zones 11 & 12. The connector 16 makes it possible for the system level expansion with other system boards (not shown). Through this connector 16, more system boards can be stackable, thus it allows more expansion boards to fit into a particular space and can process more applications.

On the system board 10, two shield expansion zones 11, 12 comprise shield areas 112, 122 which are part of ground copper clad laminate on the PCB with insulation; soldering zones 111&121, which can be soldered together with a shield metal housing cover (referring to Fig.2 the shield metal housing cover 20); and expansion connectors 113, 123. Once the shield metal housing cover 20 is mounted on to the shield expansion zone 11 or 12, they can form a complete shield house with heat sink feature. The expansion boards connecting with the system board through the expansion connectors 113 or 123 process the according applications while they are isolated from electromagnetic wave interference with the electronics outside the house. Meanwhile, electronics sealed inside the house have a good heat distribution environment.

Fig. 1A is a cut away side view of the system board taken along line A-A of Fig.1; and the side view of the expansion board, the shield metal housing cover and the add-on extra heat sink. As shown, the expansion board 21 with connector 212 can be plugged into the expansion connector 123 and mounted on to the system board 10. The components 215 & 216, which need high heat distribution, have the heat conductor blades 213 &214 on them. After the expansion board 21 is mounted on the system board 10, the shield metal housing cover 20 can cover the shield expansion zone 12 and be mounted on the system board also. The heat conductor blades 213 and 214 touch the shield metal housing cover 20 and conduct the heat from the IC 215 and 216; thus, the shield metal housing cover 20 becomes the heat sink of the whole expansion board. For heavy duty expansion board, which may generates more heat, and add-on extra heat sink 22 can be attached on to the shield metal housing cover 20 to provide extra heat distributing ability for the expansion board.

Fig.2 is an enlarged view of the shield metal housing cover and expansion board. As shown in this embodiment, the shield metal housing cover 20 is an open metal box with four small soldering edges 201,202,203 and 204, which can be soldered on to the soldering zone (referring to 111 or 121 of Fig. 1) of the system board 10. This forms the complete shield house for the expansion board 21. In some special cases, there may be holes need on the shield metal housing cover in order for some of the circuit of the expansion board 21 to extend out of the shield metal housing cover. The expansion board 21 is an individual electronic circuit board, which can perform certain functions; for instance, a LAN card to provide networking functions for the system board. The expansion board 21 comprises a PCB 211 and a connector 212 that can be connected to the expansion connector (referring to 113 and 123 of Fig.1) in the shield expansion zone (referring to 11 and 12 of the Fig.1). Once the expansion board is sealed in to the shield house, the airflow inside the house is the heat conductor for all the components. On the PCB 211, there are ICs 215,216,217,and 218. Some of them (215 and 216) need heat sink to make sure they work normally. So the heat conductor blades 213 and 214 are added on to them 215 & 216 to provide better heat distribution. An add-on extra heat sink 22 can always be added on to the shield metal housing cover 20 when better heat distribution is required.

Conclusion, Ramifications, and Scope

Accordingly, the reader can see, I've provided a computer system board with dual complete shield expansion housing solutions. With the PCB structure of the current invention, the complete system board has more compact space and whole system is easier to fit into smaller space. With the shield expansion housing solution of the current invention, more applications can be processed reliability and stably on the system board with no interference as well as good heat dissipation. Dual shield expansion housing design especially benefit to eliminate the cross interference with high heat sink ability under the situation when there are two radio frequency application expansion boards installed on to the system board.

Although the description above contains much specificity, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. Various other embodiments and ramifications are possible within it's scope. For example:

- For stackable system board, it allows more expansion boards to fit into a particular space and can process more applications.
- One system board can be designed with more than one shield expansion zones.
- Additional heat sink may be necessary for the expansion boards, which generate high heat.
- A system board may comprise multiple expansion zones on both side of the PCB.
- A system board may comprise different size of the expansion zone.
- For special type of expansion boards, an expansion zone may comprise more than one connector and other means to joint the expansion boards with the system board.
- A shield expansion housing solution may have some holes conducting circuit from inside to outside.

Thus the scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the examples given.